GLISA

GREAT LAKES INTEGRATED SCIENCES + ASSESSMENTS

June 2014 Progress Report

1. **Award Title:** Great Lakes Regional Integrated Sciences and Assessments

2. **Performance Period**: April 1, 2013 through May 30, 2014

3. **Team Members**

Co-Directors
Donald Scavia, University of Michigan
Thomas Dietz, Michigan State University

Core Team
Jeffrey Andresen, Michigan State University
Christina Dierkes, Ohio Sea Grant
Ken Frank, Michigan State University
Maria Carmen Lemos, University of Michigan
Mark Brederland, Michigan Sea Grant
Richard Rood, University of Michigan
Marilyn Thelen, Michigan State University Extension
Julie Winkler, Michigan State University

Staff
Beth Gibbons, GLISA Program Manager
William Baule, Research Associate
Laura Briley, Research Associate
Daniel Brown, Research Associate
Hannah Heyman, Undergraduate Research Assistant

Supported Graduate Students
Tingquiao Chen, Michigan State University
Meghan Charters, Michigan State University
Scott Kalafatis, University of Michigan
Samantha Basile, University of Michigan

4. New areas of focus or partnerships

Over this performance period, GLISA continued to expand its role as a regional center for sound climate information and decision making support. GLISA continues fostering its boundary organization approach to disseminating information into stakeholder knowledge networks across the Great Lakes region and through multiple sectors. GLISA's engagement with boundary organizations comes through our competitive grants program, which funded five new projects

this year at $50,000 each; through urban adaptation engagement with 6 cities via the GLAA-C project; and through contractual work with organizations that approach GLISA to develop partnerships and leverage GLISA's knowledge and resources. GLISA's approach to social science research complements and incorporates boundary organization engagement as our social scientists are tracking these partnerships and interviewing participants to glean important lessons on how decision makers interact with information, how information flows through networks and best practices for climate service. Five of these projects (starred below) were funded through GLISA's competitive grants program.

*Helping Marina and Harbor Operators Respond to Climate Change
Michigan Sea Grant
Summary:
Private marinas and small municipal harbors are struggling to fund needed improvements. Though a variety of climate adaptation tools are available, they can be overwhelming to marina and harbor managers. Information overload and uncertainty about future lake levels can result in a lack of confidence and may deter responsive actions. Marina and harbor managers need planning assistance for maintenance, repair, dredging, and general management.

The question of how changing water levels could impact the coastal communities of the Great Lakes has been brought to the forefront by various decision making bodies. This project will assist marina and harbor operators in sector-specific problem identification, decision making, and planning related to climate change adaptation. It will also develop an online training module to be introduced, developed, and tested at workshops targeting marina and harbor operators.
http://glisa.msu.edu/projects/helping-marina-and-harbor-operators-respond-climate-change

*Diversity and Deliberation on Climate Adaptation
Macalaster University
Summary: Climate vulnerabilities are distributed unevenly across races, ethnicities, classes, ages, incomes and genders. Health burdens are disproportionately located in urban heat islands with low tree canopy density. However, climate adaptation discussions generally involve a narrow group of stakeholders who represent higher education, municipal agencies and environmental NGOs. This project is driven by two profound shifts that Saint Paul residents will experience in the next thirty years: climate change a demographic transformation in which the Twin Cities are expected to experience growing racial diversity and population growth.

The objective of this project is to make climate adaptation "personal" for those who tend to remain outside of typical climate change planning discourses. The focus will be the emotional, social, and cultural values and practices that impact public understandings of and responses to climate change. The project will devise and test a neighborhood consensus conference model in Saint Paul, MN that converts the best available climate data into tangible, place-based scenarios in order to assess vulnerabilities and prioritize public investments. The project will also aim to foster the creation of self-sustaining social networks within Saint Paul.
http://glisa.msu.edu/projects/making-it-personal-diversity-and-deliberation-climate-adaptation

*WI/IL Ravine Restoration
Alliance for the Great Lakes
Summary: A series of ravines along the shoreline of Lake Michigan have become a major focus of conservationists in Northeast Illinois and Southeast Wisconsin. Restored ravines protect property values, drinking water quality, and recreational opportunities. They also decrease storm water flowing onto the beaches and into the lake, slowing erosion and decreasing water pollution. Most restoration scientists and coastal land/watershed managers agree that climate change phenomena will impact Great Lakes coastal communities. Still, there is considerable uncertainty as to the scope of the impacts on ravines, and therefore the appropriate management actions. This project provides an avenue for decision makers to implement strategies of adaptive risk management, by allowing them to co-develop, with technical experts as part of a local "knowledge network."

The predicted outcomes of the project include a strengthened knowledge network of local entities that manage ravines in Illinois and Wisconsin and collaboratively developed, climate-smart adaptation strategies. Two pilot projects will allow local ravine managers to implement those strategies and integrate metrics into their existing restoration projects. The project will also promote social learning between affected stakeholders both locally and regionally to support continued outreach beyond the term of this grant.
http://glisa.msu.edu/projects/wi-and-il-ravine-restoration-under-climate-change

*Tribal Adaptation Planning
Center for First Americans Forestland
Summary: Climate change could weaken the connections between tribal traditional knowledge and the ecology of their homelands. Traditional knowledge is seen as an important contributor to climate adaptation planning for both American Indian communities and neighboring communities in the region. This project addresses the challenge of how specific tribes can adapt to climate change in ways that ensure the protection of tribal cultures and harness cultural resources, as well as integrate the best scientific resources about environmental change, address emerging social problems, and negotiate jurisdictional challenges unique to federally-recognized tribes.

The project explores two questions: (1) Can foresight processes be used to create viable climate adaptation scenarios that can help tribes build capacities in advance? And (2) Can foresight processes involving tribal leaders and natural resource staff in the agencies and departments of federally recognized tribes garner sufficient community involvement for building scenarios that reflect tribes' cultures, social situations, knowledge needs and resources, and jurisdictional and legal complexities? To answer these questions, the project will initiate community stakeholder engagement processes of foresight for two to three tribal communities who are part of the network of the Center for First Americans Forestlands.
http://glisa.msu.edu/projects/tribal-adaptation-planning-through-participatory-foresight-development

Michigan Department of Community Health
Summary: GLISA is working with the Michigan Department of Community Health (MDCH) to develop a Climate Profile Report for the State of Michigan. The Climate Profile Report is a

synthesis of historical and future climate information for the state, with emphasis on specific geographic areas of concern. With GLISA and CDC support, MDCH previously identified several health risks and associated climate stressors, and GLISA is tailoring the climate information to address their specific concerns with respect to projected climate change.

Michigan Department of Transportation
Summary: GLISA is participating on the technical advisory committee for the Michigan Department of Transportation's climate change vulnerability risk assessment. This study provides MDOT an opportunity to use a risk management approach to evaluate the likelihood and impacts of extreme weather events on the transportation system. Funding for this effort comes through the Federal Highway Administration (FHWA) and MDOT. This Federal Highway Administration project funds pilots for Departments of Transportation, Municipal Planning Organizations, and Federal Land Management Agencies, to implement a framework to use in conducting vulnerability and risk assessments of infrastructure to the projected impacts of climate change and extreme weather events and to develop adaptation options.

Data layer development and synthesis for agricultural applications
GLISA investigator, Jeff Andresen began the development of several new agroclimatological data layers. The data layers are based on 14km resolution gridded data obtained from NASA's NLDAS2 data ensemble and cover the Great Lakes Basin. Variables in development include potential evapotranspiration, growing degree day accumulations, first and last freezing temperatures of the growing season, soil temperature thresholds, and leaf wetness duration. The data layers address agronomically important variables that are typically not available and are intended to serve as basic reference information for agricultural interests in the region.

Ongoing or Extended Engagements

*Huron River Watershed Council
Summary: Working together with the HRWC GLISA is piloting a new effort to see how maintaining a sustained relationship with a funded group beyond the initial one year grant could yield further results and allow that boundary organization to expand its work and build efficiencies into its climate information integration initiatives. The 2014 HRWC funding is aimed to see HRWC continue working with its initial four working groups and now expand into a fifth area, hazard mitigation planning. In addition to funding HRWC's engagement and assessment process, GLISA researchers are participating in evaluations of the four initial work groups and help to put evaluation measures in place for the new hazard mitigation program.

Isle Royale Scenario Planning
National Park Service invited GLISA team members to develop a description of the historical and future climate for Isle Royale National Park that could be used in climate change scenario planning with park officials. The climate information was produced through collaborations with climate change adaptation specialists with NPS and GLISA climate scientists. Three different tables were produced for the scenario planning workshop, which was focused on management of wolves. Based on the success of GLISA's work with Isle Royale we have we have formalized the relationship with the National Park Service to evaluate extensibility and scalability of structured problem solving in climate-change planning. Funding from NOAA will allow GLISA and

NPS to replicate the work done on Isle Royale in the Apostle Islands and possibly throughout the NPS network.

http://glisa.msu.edu/projects/isle-royale-national-park-climate-change-scenario-planning

Great Lakes Adaptation Assessment for Cities

GLISA is working closely with this University of Michigan project, which is funded by the Kresge Foundation and the U-M Graham Sustainability Institute. GLAA-C engages six cities from across the Great Lakes region in an integrated assessment of climate-related risks: Ann Arbor, MI; Dayton, OH; Flint, MI; Kingston, ON; Thunder Bay, ON; and Toledo, OH. GLISA Co-PIs Maria Carmen Lemos (U-M) and Ricky Rood (U-M) are members of the GLAA-C project team, and a GLISA team member is providing climate information for GLAA-C's continued work across the region.

Stakeholder evaluation assessment

Following up on past GLISA supported boundary organization work, GLISA investigator Maria Carmen Lemos and her doctoral candidate, Scott Kalafatis, are evaluating the work of GLISA's 2013 grant recipients. Additionally, Kalafatis is supporting efforts by one boundary organization (Huron River Watershed Council) to evaluate their working groups' impact over the last two years. We are in conversation with them as to what kind of support they need. Lemos and Kalafatis have also initiated a dialogue with Environment Canada to potentially support their efforts to assess the impact of their adaptive management initiatives.

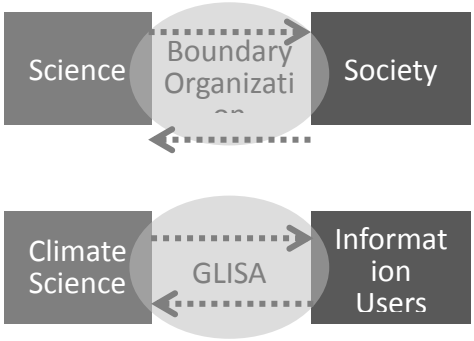
5. New Research findings

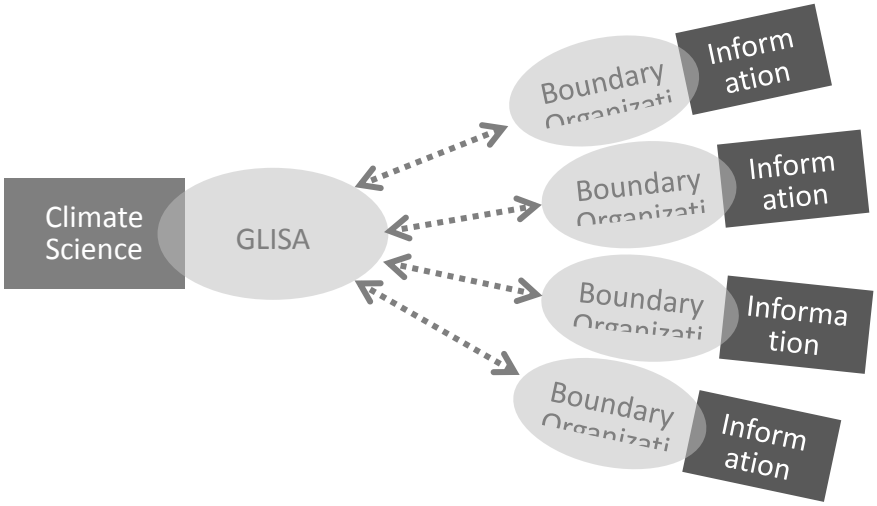
GLISA's social and physical science agenda is supported through GLISA core team faculty salary coverage, student research tuition support, and through its competitive grant program.

Boundary chains models developed

We have developed and implemented a conceptual model of a chain of boundary organizations based on GLISA's adaptive approach to engage stakeholders and disseminate climate information in the GL region. In addition, we have developed a comparative framework to analyze the different kinds of chains and outcomes that have been observed within the scope of the project.

Boundary Chains model





Public perceptions of science vary based on societal groups and 'code switching' in climate communication

The public draws distinctions between different forms of science, in particular science directed towards supporting economic production and science directed towards assessing environmental impacts. Different groups within society accord different levels of trust to these different areas of science. If communication about climate risks and adaptation is to be effective, we may need to be attentive to these differences.

Code switching and knowledge networks.

Many mediators working throughout the Great Lakes region did not use the language of "climate change" in communicating with lay audiences or stakeholders. Instead, they used the language of temperature, precipitation, etc. This is similar to "code switching," in which members of a racial minority use language to conform to a majority context (Auer , 2013). As a result, mediators deliberately choose language when communicating with stakeholders and end users. We also note that there are some members of the network who do not code switch, although typically they were less engaged in stakeholder networks than those who did code switch.

An unintended consequence of code switching is that stakeholders and end users may not be aware of the scientific sources of the knowledge presented to them. As a result, they may be exposed to a single finding through multiple mediators, appearing to reinforce certainty, when in fact the original finding is uncertain. For example, Brent Lofgren's work on lake levels presents a high level of uncertainty , but end users who hear about this paper anonymously through several mediators may not be aware of the level of uncertainty .

Maurer et al inconsistencies

GLISA researcher, Laura Briley and GLISA co-Investigator Ricky Rood, contributed to the identification and analysis of discrepancies between two versions of the Maurer gridded observations and statistical downscaling techniques based on those observations. Significant and undocumented differences between two versions of the Maurer et al 2002 national scale gridded observational datasets were discovered in the course of the evaluation of downscaled climate model output. These two national scale observational datasets, referred to here as Maurer02v1* and Maurer02v2**, are both in use in the climate applications communities, including in the RISAs and the Climate Science Centers. At some isolated locations the differences in long term means were larger than 8C, while at others, jumps of several degrees C were seen in the difference timeseries. It was during an analysis of a particular location in New York that large differences were first noticed, and this finding prompted further comparison at larger spatial scales. From the comparisons, two main cases were identified where we see large differences between the data sets: 1) at the boundary of river basins and 2) primarily at targeted locations in the eastern US where one of the time series has inhomogeneous data (a large jump occurred). User applications of the data that do not correspond with regions where differences are large are likely less sensitive to the presence of errors. Any local analysis performed particularly close to one or more of the locations of large discrepancies should proceed cautiously. Several research questions remain about the ultimate impacts that users must consider.

Disorganized integration: Vulnerability assessments need to address existing weaknesses before integrating climate change impacts

Based on GLISA's ongoing engagement with a variety of boundary organizations over the past several years, the team has identified that it is most effective to work with the partner to develop a thorough understanding of existing vulnerabilities prior to introducing potential climate changes and impacts to their assessment process. This approach is counter to what many partners expect from their engagement with GLISA. GLISA frequently receives requests to provide partners with a list of potential climate changes and impacts that could be relevant to risks the stakeholder faces. Those changes and impacts would then be used by the stakeholder to build adaptation strategies. However, by first identifying where existing weaknesses exist the GLISA team is better able to identify what thresholds of change a system is able to sustain and provide more precise and useable climate related impact information for the end-user.

Planning activities must accommodate a changing future

From GLISA's Isle Royale Project a key lesson learned is there is a need to plan actively for the best possible future rather for restoration to a past state or for conservation of the status quo. Planning for restoration or maintaining the status quo without realistically reflecting the changes taking place in our climate and subsequently in ecosystems will not lead to effective and candid vulnerability or needs assessment process.

6. Accomplishments

The following highlight some of the key accomplishments of GLISA during this reporting period.

Great Lakes Climate Assessments Grants

A central component of the GLISA organization is an annual funding competition for Great Lakes Climate Assessments Grants. Based on input from advisory committees, GLISA continued to expand its work with regional partners, by leveraging its 2013 grants program and funding a diverse cohort of projects across the region. We received 45 letters of interest and invited 12 organizations to submit full proposals. Four projects were initially funded at $50,000. A fifth project was added through a continuation grant to Huron River Watershed Council, which is allowing HRWC to expand their initial scope of work and pilot a sustained assessment funding initiative. GLISA will maintain an ongoing relationship with grant recipients by providing technical assistance to the projects and facilitating interaction among project teams. Furthermore, GLISA-supported social scientists are evaluating the projects through observation and interviews with key stakeholders.

New GLISA Website launched

In early 2014 GLISA launched an updated website. The new look and feel allows users to access information on GLISA's approach to climate adaptation and examples of past work more easily. Additionally, the new website features a re-organized and revised resources section aimed at providing useful and useable regional and local climate information and climate impact information. Updated Website: GLISA.MSU.EDU

Climate Impacts and Synthesis Reports

Building on the positive response that we received and continue to receive to the local climatologies, GLISA staff is progressively developing synthesis reports and summaries on various impact areas and needs. In tandem with this effort GLISA staff regularly assists boundary organization partners to reanalyze specific data or synthesis reports to fit a local or sector-specific need.

National Climate Assessment

This year saw the completion of several initiatives led by GLISA investigators:

- GLISA co-principle investigator served as the convening lead author of the Midwest Chapter of the National Climate Assessment.
- Julie Winkler, GLISA co-investigator led converting the Midwest Technical Input Report that) into an Island Press published book.
- Co-PI Thomas Dietz and co-investigator Maria Carmen Lemos continue to serve on the National Research Council Committee that will review the NCA and its application and use.

Great Lakes Synthesis Report – As a complement to the NCA, GLISA produced a Synthesis Report of the NCA derived from the Midwest and Northeast chapters, which will help stakeholders in the region to discern the key messages for our the eight-state region by climate change and impact.

GLISA Annual Meeting

GLISA held its third annual meeting on November 4 & 5, 2013 at the University of Michigan in Ann Arbor. The meeting was comprised of three distinct events. First, GLISA team members facilitated a workshop for recipients of its 2012 competitive grants. Approximately 85 participants then attended a half-day symposium, which highlighted GLISA resources, emerging research, and brief presentations for GLISA supported boundary organizations and partners. On the final morning, GLISA met with members of its science and stakeholder advisory committees to evaluate its programs and discuss priorities for the coming year.
The GLISA Annual meeting was held in conjunction with other University of Michigan Sustainability events and was the lead public event of University of Michigan's Climate Adaptation Week.

7. <u>Outreach activities undertaken in the past year.</u>

GLISA Symposium

The annual GLISA Symposium attracts a larger and more diverse audience each year. This event offers the greatest opportunity for GLISA to showcase its breadth of work to a highly engaged audience. This year's symposium attracted 85 registrants.

Boundary Organization Engagement

Inherent in GLISA's model is our engagement with boundary organizations from across the Great Lakes region. Our engagement ranges from participating at meetings and workshops as presenters to providing sound climate information and resources to support boundary organization staff to become the climate messenger. GLISA staff and faculty provide climate science support to funded and non-funded partners alike. GLISA affiliates participated in over 50 public engagement events over the past year. Several highlights are described below:

Great Lakes Water Quality Agreement Annex 9

Two GLISA affiliates, Jeff Andresen and Beth Gibbons were nominated and appointed as an extended subcommittee member of Annex 9 of the USA/Canada International Joint Commission on Great Lakes Water Quality Agreement.

Peer Network Engagements

GLISA serves in a membership and advisory capacity on a number of membership organizations or peer to peer networks. Through these engagements GLISA shares best science practices for the Great Lakes region and provides insight to the scientific and academic communities on stakeholder needs and engagement approaches. These networks include:

- Michigan Climate Coalition
- Michigan State University Extension Coalition
- NOAA Great Lakes Regional Coordination collaboration Team
- American Society of Adaptation Professionals
- Detroit Climate Action Collaborative and Technical Advisory Team
- Ann Arbor Technical Advisory Group
- Public Engagement through faculty and staff presentations: over 75 presentation and

8. Completed Publications, White Papers, or Reports

Takle, E., C. Anderson, J. Andresen, J. Angel, R. Elmore, B. Gramig, P. Guinan, S. Hilberg, D. Kluck, R. Massey, D. Niyogi, J. Schneider, M. Shulski, D. Todey, and M. Widhalm, 2014. Climate Forecasts for Corn Producer Decision-Making. Earth Interact. 18: 1–8. E-doi: http://dx.doi.org/10.1175/2013EI000541.1.

Andresen, J.A., G. Alagarswamy, G. Guentchev, Perdinan, K. Piromsopa, A. Pollyea, G. Soter, J. Van Ravensway, and J. Winkler, 2013. Potential Impacts of Future Climate on Row Crop Production in the Great Lakes Region. Chapter 6 in 'Climate change impacts, risk, vulnerability, and adaptation in the Midwestern United States', S.C. Pryor, ed. , Indiana University Press, Bloomington, IN, pp 82-91.

Lemos, M. C., C. J. Kirchhoff, S. E. Kalafatis, D. Scavia and R. B. Rood (2014). "Moving climate information off the shelf: Boundary Chains and the role of RISAs as adaptive organizations." *Weather, Climate, and Society*. In press.

Bidwell, David, Thomas Dietz, and Donald Scavia. 2013. "Fostering knowledge networks for climate adaptation." Nature Climate Change 3:610-611.

The Practitioner's Dilemma: How to Assess the Credibility of Downscaled Climate Projections," Barsugli, J. J., Guentchev, G., Horton, R., Wood, A., Mearns L. O., Liang, X. Z., Winkler, J., Dixon, K., Hayhoe, K., Rood, R. B., Goddard, L. Ray, A., Buja, L., Ammann, C., *EOS, Trans. Amer. Geophys. Union*, 94, 424-425, DOI: 10.1002/2013EO460005, 2013.

Using Climate Change Scenarios to Explore Management as Isle Royale National Park: January 2013 Workshop Report, N. Fisichelli, C. Hawkins Hoffman, L. Welling, L. Briley, and R. Rood, Natural Resource Report NPS/NRSS/CCRPNRR – 2013/714, National Park Service, Fort Collins, CO, 2013. (http://irmafiles.nps.gov/reference/holding/483446)

Winkler, J.A., J.A. Andresen, J.L. Hatfield, D. Bidwell, and D. Brown (Editors), 2014. *Climate Change in the Midwest: A Synthesis Report for the National Climate Assessment*, Island Press, in press. *[Expected publication in June, 2014.]*

9. Please provide information on activities from the past year.

15	Number of plans, policies, strategies, tools, agreements, etc. proposed, adopted, and/or implemented as a result of GLISA work.
37	Numbers of tools, datasets, and resources used by stakeholders
4	Number of grad students supported by RISA funding

9a (Optional Evaluation Methods):
Through collaboration with the National Park Service GLISA co-investigator Ricky Rood will be leading an effort to replicate the work that GLISA supported in Isle Royale to integrate climate change into scenario planning. This effort will test whether or not GLISA's approach to scenario planning with the Park Service is replicable and if we can build efficiency into these scenario planning approaches.

GLISA Co-investigator Maria Carmen Lemos is seeking funding to compare the effectiveness of various approaches to boundary organization engagement. This research would compare the effectiveness of GLISA's approach to working with the Huron River Watershed Council, the National Park Service, and The Great Lakes Adaptation Assessment for Cities.

10. Please fill out the attached project database template for projects that meet all of the following criteria (NOTE: These criteria are generally a judgment call on the part of the Principal Investigator(s) and/or the Program Managers and do not require extensive analysis. Criteria should NOT be listed in database.):

    - Core RISA projects – Determined by one or more of the following:
        i. RISA investigator is leading the effort
        ii. RISA is primary source of funding
        iii. RISA capacity is critical to the project (e.g. Regional Chapters/Technical Inputs of the NCA)
    - Current projects – Determined by one or more of the following:
        i. Recently completed (i.e. finished within the last six months)
        ii. Ongoing (i.e. initiated, but not completed)
        iii. Planned (i.e. funded but not started)